Method for performing USTS handover and USTS mode switchin in a mobile communication system

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Disclosed is a handover controlling method in an RNC connected to a first Node B and a second Node B in a mobile communication system where a USTS service occurs between the first Node B and a UE within a cell of the first Node B and the UE hands over when the UE is located in a handover area across the cell areas of the first Node I and the second Node B adjacent to the first Node B. The method comprises determinin whether the handover for the UE is possible or not; transmitting handover information t the second Node B if the handover is possible; and transmitting a command to the UE through the first Node B, requesting the UE to hand over to the second Node B if the U receives a response message indicating that the handover is possible from the second Node B.

Method for performing USTS handover and USTS mode switchin in a mobile communication system

Description of corresponding document: **WO0207345**

METHOD FOR PERFORMING USTS HANDOVER AND USTS MODE SWITCHING IN A MOBILE COMMUNICATION SYSTEM
BACKGROUND OF THE INVENTION
1. Field of the Invention
The, present invention relates generally to a channel communication method in a mobile communication system, and in particular, to a method for performing a handover and mode switching using an uplink synchronous transmission scheme (USTS).

2. Description of the Related Art
A CDMA (Code Division Multiple Access) mobile communication system is divided into a synchronous system and an asynchronous system. Such a
CDMA communication system uses orthogonal codes to separate channels.

Herein, a description of the invention will be made with reference to an asynchronous W-CDMA (Wideband-CDMA) communication system, also known as a UMTS (Universal Mobile Telecommunications System) communication system. However, the invention can also be applied to different CDMA systems such as the CDMA-2000 system, as well as the W-CDMA system.

The W-CDMA communication system employs an uplink synchronous transmission scheme (USTS) in which a first Node B communicates with a plurality of UEs (User Equipments) through radio links formed between them while maintaining an orthogonal property among the signals received from the respective UEs. For the USTS, the Node B transmits a control signal to the UEs so that the respective UEs can transmit their signals at a time proper to maintain the orthogonal property among the UEs. Upon receipt of the control signal, the
UEs align a transmission time of the uplink signals.

FIG.1 illustrates architecture of a conventional W-CDMA communication system. As illustrated, a radio network controller (RNC) controls a process for connecting the UE. Further, the RNC manages assignment of channel resources to the UEs connected to one or more Node Bs. The Node Bs and the RNC constitute a UTRAN (UMTS Terrestrial Radio Access Network).

When successfully connected to the Node B through the channel assigned by the RNC,the UE maintains communication using the assigned downlink or uplink dedicated physical channel (DPCH). The RNC can communication with a plurality of UEs through the Node B. In this case, the UE scrambles its transmission data using its unique scrambling code and transmits the scrambled data as an uplink signal, so that the Node B can distinguish the uplink signals received from the respective UEs by descrambling each uplink signal withUE's unique scrambling code.

The scrambling code is classified into a long scrambling code and a short scrambling code. In the following description, the"scrambling code"will refer to the long scrambling code.

The scrambling code is created in the following processof : (Step 1) receiving 24 initial

valuesnO, nl,.., n23, (Step 2) creating sequences x (i)and y (i), wherei=0,.., 2zs-27, x(0) =nO, x(l) =nl, x (2) =n2,..., x (23) =n23, x (24)=1 x(i+25) =x(i+3) +x(i) modulo 2, i=0, ..., 225-27 y(0)=y(1)=y(2)=...=y(23)=y(24)=1 y (i+25) =y (i+3) +y (i+2) +y (i+2) +y (i) modulo 2,i=0,..., 225-27 (Step 3) creating a sequence z (i), wherei=0,.., <SEP> IE <SEP> type <SEP> and <SEP> Semantics <SEP> Critica <SEP> Assigned
<tb> IE/Group <SEP> Name <SEP> Presence <SEP> Rang <SEP> reference <SEP> description <SEP> lity <SEP> Criticality
<tb> Message <SEP> Discriminator <SEP> M <SEP> 9.2.1. <SEP> 45
<tb> Message <SEP> Type <SEP> M <SEP> 9.2. <SEP> 1.46 <SEP> YES <SEP> reject
<tb> CRNC <SEP> Communication <SEP> Context
<tb> ID <SEP> M <SEP> 9. <SEP> 2. <SEP> 1. <SEP> 18 <SEP> YES <SEP> reject
<tb> Transaction <SEP> ID <SEP> M <SEP> 9.2. <SEP> 1.62
<tb> UL <SEP> DPCH <SEP> Information <SEP> 1 <SEP> YES <SEP> reject
<tb> > UL <SEP> Scrambling <SEP> Code <SEP> M <SEP> 9.2. <SEP> 2.59
<tb> > Min <SEP> UL <SEP> Channelisation <SEP> Code
<tb> <SEP> M <SEP> 9.2.2.22
<tb> length
<tb> > Max <SEP> Number <SEP> of <SEP> UL <SEP> DPDCHs <SEP> C <SEP> 9.2.2.21
<tb> <SEP> CodeLen
<tb> > puncture <SEP> limit <SEP> M <SEP> 9.2.1. <SEP> 50 <SEP> for <SEP> UL
<tb> > TFCS <SEP> M <SEP> 9. <SEP> 2.1.58 <SEP> for <SEP> UL
<tb> > UL <SEP> DPCCH <SEP> Slot <SEP> Format <SEP> M <SEP> 9. <SEP> 2.2.57
<tb> > <SEP> UL <SEP> SIR <SEP> Target <SEP> M <SEP> UL <SEP> SIR
<tb> <SEP> 9.2.2.58
<tb> > Diversity <SEP> mode <SEP> M <SEP> 9. <SEP> 2.29
<tb> > D <SEP> Field <SEP> Length <SEP> C <SEP> FB <SEP> 9. <SEP> 2.2.5
<tb> > SSDT <SEP> cell <SEP> ! <SEP> D <SEP> Length09. <SEP> 2.2.45
<tb> > S <SEP> Field <SEP> Length <SEP> O <SEP> 9. <SEP> 2.2.40
<tb> > USTS <SEP> Indicator <SEP> O
<tb> > USTS <SEP> Channelisation <SEP> Code <SEP> C
<tb> Number <SEP> USTS
<tb> -Omitted
<tb> <SEP> I <SEP> to
<tb> RL <SEP> Information-maxnoof <SEP> EACH <SEP> notify
<tb> <SEP> RLs >
<tb> > RL <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.53
<tb> > C-ID <SEP> M <SEP> 9. <SEP> 2.1.9
<tb> > First <SEP> RLS <SEP> Indicator <SEP> M
<tb> > Frame <SEP> Offset <SEP> M <SEP> 9. <SEP> 2.1.31
<tb> > Chip <SEP> Offset <SEP> M <SEP> 9. <SEP> 2.2.2
<tb> > Propagation <SEP> Delay <SEP> 0 <SEP> 9.2.2.35
<tb> <SEP> C
<tb> > Diversity <SEP> Control <SEP> Field <SEP> NotFirst <SEP> 9.2.2.7
<tb> <SEP> RL
<tb> > USTSoffset
<tb> -Omitted

In Table1, USTS Channelization Code Number (USTS CH code NO) indicates a corresponding number in the OVSF code tree for a given SF in Min UL Channelization Code Length. For example, ifSF=4, the USTS Channelization Code Number has one of the values 0,1,2 and 3. The USTS Channelization Code Number of 0 indicates the highest code node in the OVSF code tree, the USTS

Channelization Code Number of 1 indicates the second highest code node in the OVSF code tree, the USTS Channelization Code Number of 2 indicates the third highest code node in the OVSF code tree, and the USTS Channelization Code Number of 3 indicates the lowest code node in the OVSF code tree. In Table1, the USTS Channelization Code Number is markedwith'C USTS'in a Presence column, since this information is necessary only for the USTS handover. This indicates that the USTS Channelization Code Number is Conditional information which is required only for the USTS service or required only when there exists the USTS Indicator.

In Table1, USTS offset indicates the scrambling code time offset information. The new cell can approximately synchronize the uplink and the downlink for the UE using a Frame Offset value and a Chip Offset value transmitted from the SRNC. However, the UE employing the USTS does not align the scrambling code start point with the frame start point during transmission of the UL DPCH, so that the new cell must receive the scrambling code time offset information in order to search the scrambling code start point.

The scrambling code time offset value can be defined as a value which is created when the UE employing the USTS sets an offset by separating the scrambling code start point from the frame start point in order to align the UL scrambling codes to the UEs using the same scrambling code. As a result, upon receipt of the scrambling code time offset, the new cell can search the start point of the scrambling code for the UL DPCH depending on the received scrambling code time offset. For example, the scrambling code time offset can be used for the offset value in Table1.

Table 2 shows a format of the Radio Link Setup Request (or Radio Link Addition Request) message in the W-CDMA mobile communication system supporting the USTS service according to another embodiment of the present invention, wherein oneUE uses a pluralityof DPDCHs and the same SF.

Table 2
EMI30.1

<tb> <SEP> IE <SEP> type <SEP> Assigned
<tb> <SEP> Presenc <SEP> Semantics <SEP> Criticali
<tb> IE/Group <SEP> Name <SEP> Range <SEP> and <SEP> Criticalit
<tb> <SEP> e <SEP> description <SEP> ty
<tb> <SEP> reference <SEP> y
<tb> Message <SEP> Discriminator <SEP> M <SEP> 9.2.1.45
<tb> Message <SEP> Type <SEP> M <SEP> 9. <SEP> 2.1.46 <SEP> YES <SEP> reject
<tb> CRNC <SEP> Communication
<tb> <SEP> M <SEP> 9.2.1.18 <SEP> YES <SEP> reject
<tb> Context <SEP> ID
<tb> Transaction <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.62
<tb> UL <SEP> DPCH <SEP> Information <SEP> 1 <SEP> YES <SEP> reject
<tb>
EMI31.1

<SEP> > UL <SEP> Scrambling <SEP> Code <SEP> M <SEP> 9.2.2.59
<tb> <SEP> > Min <SEP> UL <SEP> Channelisation
<tb> <SEP> Codelength
<tb> <SEP> > Max <SEP> Number <SEP> of <SEP> UL

<tb> <SEP> CodeLe <SEP> 9.2.2.21
<tb> <SEP> DPDCHs <SEP> (Removable)
<tb> <SEP> n
<tb> <SEP> -Omitted <SEP> > USTS <SEP> Indicator <SEP> O
<tb> <SEP> > USTS <SEP> Channelisation <SEP> C <SEP> 1 <SEP> to
<tb> <SEP> < maxnoof
<tb> <SEP> Code <SEP> Information <SEP> USTS <SEP> CH >
<tb> <SEP> <SEP> USTS <SEP> Channelisation
<tb> <SEP> CodeNumber
<tb> <SEP> -Omitted <SEP> 1 <SEP> to
<tb> <SEP> RL <SEP> Information <SEP> < maxnoofR <SEP> EACH <SEP> notify
<tb> <SEP> Ls >
<tb> <SEP> > RL <SEP> ID <SEP> M <SEP> 9.2.1.53
<tb> <SEP> > C-ID <SEP> M <SEP> 9. <SEP> 2.1.9
<tb> <SEP> > First <SEP> RLS <SEP> Indicator <SEP> M
<tb> <SEP> > Frame <SEP> Offset <SEP> M <SEP> 9. <SEP> 2. <SEP> 1.31
<tb> <SEP> > Chip <SEP> Offset <SEP> M <SEP> 9. <SEP> 2.2.2
<tb> <SEP> > Propagation <SEP> Delay09. <SEP> 2.2.35
<tb> <SEP> C
<tb> <SEP> > Diversity <SEP> Control <SEP> Field <SEP> NotFirst <SEP> 9.2.2.7
<tb> <SEP> RL
<tb> <SEP> C
<tb> <SEP> > USTS <SEP> offset
<tb> <SEP> -omitted

Table 2 corresponds to a case where a plurality of channelization code nodes are used for one SF. Therefore, in Table 2, USTS Channelization Code Information indicates a USTS channelization code number which can be repeated as many times as the number of channels assigned to one group and are required every time. Therefore, in Table 2, the USTS Channelization Code Number (USTS CH code NO) indicates a corresponding number in the OVSF code tree for a given SF in Min UL Channelization Code Length. For example, if SF=8, the USTS Channelization Code Number has some of the values 0,1,..., 7. Max Number of UL DPDCHs is removable from Table 2.

Table 3 shows a format of the Radio Link Setup Request (or Radio Link Addition Request) message in the W-CDMA mobile communication system supporting the USTS service according to another embodiment of the present invention, wherein one UE uses a plurality of DPDCHs and the different SFs.

Table 3
EMI32.1

<tb> <SEP> IE <SEP> type <SEP> Assigned
<tb> <SEP> Semantics <SEP> Criticalit
<tb> IE/Group <SEP> Name <SEP> Presence <SEP> Range <SEP> and <SEP> Criticalit
<tb> <SEP> descriptiony
<tb> <SEP> reference <SEP> y
<tb> Message <SEP> Discriminator <SEP> M <SEP> 9.2.1.45
<tb> Message <SEP> Type <SEP> M <SEP> 9.2.1.46 <SEP> YES <SEP> Reject
<tb> CRNC <SEP> Communication
<tb> Context <SEP> ID <SEP> M <SEP> 9.2.1.18 <SEP> YES <SEP> Reject
<tb> Transaction <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.62

<tb> UL <SEP> DPCH <SEP> Information <SEP> 1 <SEP> YES <SEP> Reject
<tb> > UL <SEP> Scrambling <SEP> Code <SEP> M <SEP> 9. <SEP> 2.2.59
<tb> > Min <SEP> UL <SEP> Channelisation
<tb> Code <SEP> length <SEP> (Removable) <SEP> M <SEP> 9. <SEP> 2. <SEP> 2. <SEP> 22
<tb> > MaxNumber <SEP> of <SEP> UL
<tb> DPDCHs <SEP> (Removable) <SEP> CodeLen <SEP> 9. <SEP> 2. <SEP> 2. <SEP> 21
<tb> -Omitted
<tb> > USTS <SEP> Indicator <SEP> O
<tb> <SEP> 1 <SEP> to
<tb> > USTS <SEP> Channelisation <SEP> C
<tb> Code <SEP> Information <SEP> USTS
<tb> <SEP> oim >
<tb> > Min <SEP> UL
<tb> Channelisation <SEP> Code <SEP> M
<tb> length
<tb> #USTS <SEP> Channelisation <SEP> M
<tb> CodeNumber
<tb> -Omitted
<tb> <SEP> 1 <SEP> to
<tb> RL <SEP> Information <SEP> < maxno <SEP> EACH <SEP> notify
<tb> <SEP> ofRLs >
<tb> > RL <SEP> ID <SEP> M <SEP> 9.2.1.53
<tb> > C-ID <SEP> M <SEP> 9. <SEP> 2.1.9
<tb> > First <SEP> RLS <SEP> Indicator <SEP> M
<tb> > Frame <SEP> Offset <SEP> M <SEP> 9.2.1.31
<tb> > Chip <SEP> Offset <SEP> M <SEP> 9.2.2.2
<tb> > Propagation <SEP> Delay <SEP> O <SEP> 9. <SEP> 2.35
<tb> <SEP> C
<tb> > Diversity <SEP> Control <SEP> Field <SEP> NotFirstR <SEP> 9.2.2.7
<tb> <SEP> L
<tb> <SEP> C
<tb> > USTS <SEP> offset <SEP> USTS
<tb> -Omitted

Table 3 corresponds to a case where a plurality of channelization code nodes are used for several SFs. In this case, Min UL Channelization Code Length and Max Number of UL DPDCHs are removable from Table 3. In Table 3, USTS Channelization Code Information indicates Min UL Channelization Code Length for SF information and a USTS channelization code number, which can be repeated as many times as the number of channels assigned to one group and are required every time. Therefore, in Table 3, the Min UL Channelization Code Length can have one of the values 4,8,16,32,64,128 and 256. In each case, the USTS Channelization Code Number indicates a corresponding number in the OVSF code tree for a given SF in Min UL Channelization Code Length. For example,if SF=8, the USTS Channelization Code Number has some of the values0, 1,..., 7.

It is assumed in Tables 1 to 3 that the channelization code for the ULDPCCH is not notified with separate information. That is, it is possible not to notify the separate information by previously determining a specific rule between the DPDCH and the DPCCH such that a specially mapped SF=256 channelization code node should be used for the DPCCH, when a certain OVSF code node is assigned to the channelization code for the DPDCH. Of course, when the channelization code node to be used for theDPCCH is not previously designated, information indicating the channelization code

node for the DPCCH must be additionally inserted in the above tables. Since the SF=256 channelization code node is always used for the DPCCH, it is necessary to notify information about which ofSF=0 to SF=254 code nodes is to be used.

Meanwhile, the UL scrambling code of a UE operated based on USTS can be transmitted in the same form as information transmitted on a typical DPCH. Because the UL scrambling code is for USTS in the cell, a new cell to which the UE hands over a call must know the USTS scrambling code beforehand.

USTS scrambling codes are known in many ways.

(1) The first way is to transmit the USTS indicator. A cell receiving the USTS indicator (a corresponding Node B or RNC) recognizes the UE uses USTS and a different handover from that on a typical DPCH is required.

(2) Some of UL scrambling codes are preset for USTS in the same manner as saving part of the UL scrambling codes for RACHs orCPCHs. Then, the SRNC transmits the UL scrambling codes for USTS to the Node B or RNC so that the Node B or RNC can recognize that the UE uses the USTS.

(3) The third way relies on presence or absence of channelization code information. If there exists information about the scrambling code and DPCCH channelization code of the UE using the USTS, this implies that it can be determined the handover UE uses the USTS. It is because such channelization code information is different from that for a typical DPCH.

Once the UE succeeds in establishing a new radio link, it can continue the USTS service in one cell and perform a general DPCH or USTS service in other cells. If this procedure is repeated, there may exist the case where one UE is connected to one cell by a USTS service and to at least one other cell on a DPCH.

In this case, the UE collectively receives data from the plurality of cells as one piece of information. The cell, with which the UE communicates for the USTS service, may utilize part of TPC information for a different use, that is, as a TAB (Time Alignment Bit) for tracking. Accordingly, the UE needs to recognize the TAB separately from the information received from the cells.

Now, the operations of each UE, the SRNC, and the Node B for a handover of a UE using the USTS will be described below.

The UE transmits UL data while maintaining the USTS service. That is, the UE establishes a new radio link while maintaining the USTS service where a scrambling code start point can differ from a frame start point, i. e., the start point of an uplink data frame, and then receives data from different cells collectively as one piece of information. Since the cell connected to the UE by the USTS service may use part of TPC information as a TAB for tracking, the UE interprets the TAB separately from TPC information received from the other cells. Thus, the UE maintains tracking for the USTS using the TAB from the USTS-connected cell, and neglects TPC information received from the other cells at the same time point or uses it for power control.

A description of the SRNC will be given below with reference to FIG. 12.

FIG. 12 is a flowchart illustrating the operation of the SRNC during a handover. In

step101, the SRNC receives a measurement report from the UE and determines a handover for theUE. The SRNC transmits a Radio Link Setup Request message to the Node B of a new cell in step 102. The Radio Link Setup Request message includes USTS parameters for a USTS handover. The USTS parameters are the UL scrambling code information, the UL channelization code information, the USTS indicator information, and the scrambling code time offset information. The USTS parameters, information about the UE using the USTS, are stored in the SRNC. In step 103, the SRNC receives a Radio Link Setup Response message from the target Node B in response to the Radio Link Setup Request message. The SRNC determines whether the handover is possible by analyzing the Radio Link Setup Response message in step 104. If the USTS handover is possible, the SRNC goes to step 105, and otherwise, the SRNC goes to step 106.

It can be determine that the USTS handover is impossible in step 104 in the following cases: (1) the target Node B does not support the USTS; (2) although the target Node B supports the USTS, it does not support the USTS handover; or (3) the USTS handover fails as in the conventional technology. In step 105, the SRNC transmits an RRC signaling message to the UE for handover.

Here, the RRC signaling message is an Active Set Update message containing the same contents as a message transmitted during a handover in the conventional technology. Meanwhile, the SRNC ends the procedure with the USTS maintained, considering the handover is failed in step 106.

In the above description of the USTS handover, it is assumed that the SRNC is identical to a CRNC and the new cell is in a different Node B. If the new cell is in the same Node B, the Radio Link Setup Response message is replaced by a Radio Link Addition Request message in the case of FIG. 6. On the other hand, if the SRNC is different from the CRNC, that is, the UE is connected to the SRNC via a DRNC, the SRNC transmits the USTS parameters to the target Node B via the DRNC in step 102. Here, the Radio Link Setup Response message being an RNSAP message is used between the SRNC and the DRNC.

The DRNC transmits the USTS parameters by a Radio Link Setup Response message being an NBAP message to the target Node B.

Referring to FIG. 13, the operation of the Node B will be described.

FIG. 13 is a flowchart illustrating the operation of the Node B in a new cell for the handover. In step 201, the target Node B receiving the handover request receives a handover-related message from the SRNC in step201. It is assumed herein that the new cell is in a different Node B from that of the UE.

Therefore, the handover-related message is an NBAP message, a Radio Link Setup Response message. On the other hand, if the new cell is in the same Node B, the handover-related message is a Radio Link Addition Request message. The Radio Link Setup Response message includes the USTS parameters, that is, the UL scrambling code information, UL channelization code information, USTS indicator information, and scrambling code time offset information, as stated before.

In step 202, the target Node B determines whether the USTS handover is possible. That is, upon receipt of the Radio Link Setup Response message, the target Node B determines whether it will support the USTS handover. If the USTS handover is impossible, the target Node B transmits a Radio Link Setup

Failure message to the SRNC in step 207 and ends the procedure.

If the handover is possible in step 202, the target Node B transmits the Radio Link Setup Response message to the SRNC in response to the received Radio Link Setup Request message in step 203 and prepares for UL channel coding according to the USTS parameters set in the received Radio Link Setup Response message in step 204. In step205, the target Node B performs scrambling code synchronization by the difference between a frame start point and a scrambling code start point according to the scrambling code time offset.

Specifically, the target Node B shifts the scrambling code from the frame start point by the scrambling code time offset for synchronization of scrambling codes to thereby prepare for spreading. In step 206, the target Node B receives the UL DPCH data from the UE using the results prepared in steps 204 and 205 and ends the procedure.

In the description of the handover operation of the target Node B, the target Node B knows that the UE is receiving the USTS service from the cell of a different Node B or the cell of the same Node B. Therefore, the target Node B can also recognize that the UE continues synchronization by tracking at every frame according to the USTS service. To synchronize at a frame level, the UE can transmit UL data on a1/n chip basis and thus it operates suitably. Or the fact that the UE may not respond to the last TPC value can be utilized.

In another embodiment of the present invention, conversion (or switching) from a typical DPCH connection state (i. e., a normal mode or a non USTS mode) to a USTS mode will be described.

If the SRNC determines that the UE operating in the USTS mode becomes remote from the cell providing the USTS service, it discontinues the USTS service and uses the typical DPCH, or performs the USTS operation in a cell with the highest signal strength. The USTS operation is a Radio Link Reconfiguration procedure. Here, the SRNC determines from a measurement received from the UE that the UE is moving outside of the USTS serviceproviding cell. The mode conversion covers conversion of a USTS mode, a normal mode, and a non-USTS mode.

By the Radio Link Reconfiguration procedure, the SRNC terminates the USTS mode of the UE and transitions the UE to a normal mode or a non-USTS mode, or vice versa. Both conversions may occur simultaneously.

The normal mode refers to assignment of a typical DPCH to the UE. The non-USTS mode, used discriminatively from the normal mode, occurs to a UE which being requested to establish a radio link with a new cell due to its mobility in the USTS mode, is connected to other cells by typical DPCHs, while maintaining the USTS service with the current serving cell.

For conversion from the normal mode to the USTS mode, information set in the Radio Link Setup message or the Radio Link Addition message is transmitted by the Radio Link Reconfiguration message. When the UE requesting conversion to the USTS mode is connected to a new cell by handover, the UE and the new cell can be connected on typical DPCHs. If the UE is released from the connection to the old UTST service providing cell, the UE receives a general DPCH service. If the new cell is capable of providing the USTS service, the SRNC can convert the normal mode to the USTS mode again by the

Radio Link Reconfiguration procedure.

Mode conversions of the UE will be described hereinbelow. Two cases can occur to a UE receiving the USTS service from a cell on a radio link. The one is that the UE becomes the first to be assigned to a USTS scrambling code, and the other is that the UE is assigned to a scrambling code while a USTS scrambling code is in use for other UEs for the USTS service.

As to the former case, (1) the SRNC transmits information about UL scrambling codes for USTS and UL DPDCH and DPCCH channelization code information, that is, USTS parameters to the Node B. The USTS parameters are transmitted by a Radio Link Reconfiguration message or another signaling message. (2) The Node B transmits time information measured on the radio link established with the SRNC. The time information is one of the time difference between the start point of a current received UE frame and that of a P-CCPCH frame, a value required to make the time difference is 256chipsxm, anda PD.

The PD is calculated by subtracting To from the difference between the start points of a corresponding DP DPCH frame and a UL DPCH frame. (3) The SRNC transmits time information received from the Node B to the UE. (4) the UE transmits on the uplink for USTS using the time information.

In the case whether the UE is the first to be assigned to a USTS scrambling, code, the UE, the SRNC, and the Node B operate in the following as compared to the conventional ones.

The UE requests conversion to the USTS mode to the Node B during communicating on a DPCH, or the Node B attempts conversion to the USTS mode for the UE that is placed in a normal mode or a non-USTS mode after the USTS mode.

The UE transmitsUL DPCH data based on a time offset for USTS in the information received from the SRNC for conversion to the USTS mode. If the time offset is 0, the UE performs the conventional DPCH operation. On the contrary, if the time offset is not 0, the UE performs synchronization by the time offset. The time offset is information required to make the difference between the start points of a current received UE frame and a P-CCPCH frame be 256chipsxm, that is, time information representing how much earlier or later the UE should transmit a UL DPCH with respect to the previous UL DPCH, or information about a PD generated during transmission of a UL DPCH. Upon receipt of the PD, the UE transmits theUL DPCH earlier by the PD.

The SRNC determines the time offset, and the UE receiving the time offset transmits theUL DPCH earlier or later by the time offset. If the UE is the first one to transition to the USTS mode, that is, there is no UE receiving the USTS service, the UE becomes a reference for the other UEs. If a USTS scrambling code is synchronized based on a P-CCPCH, the UE can perform scrambling code synchronization. In this case, the SRNC transmits time information for the scrambling code synchronization and the UE, upon receipt of the time information, delays the scrambling code by the time offset prior to transmission. The scrambling code synchronization is performed by the UE scrambling code synchronizer shown in FIG. 4.

Now the operation of the SRNC will be described with reference to FIG.

14:

FIG. 14 is a flowchart illustrating the operation of the SRNC when the UE is transitioned to the USTS mode during communication on a DPCH.

Referring to FIG. 14, the SRNC determines conversion to the USTS mode for the UE communicating on the DPCH according to a measurement report received from the UE in step 301. Conversion to the USTS mode can be determined upon request from the UE. In step 302, the SRNC transmits a Radio Link Reconfiguration Prepare message to the Node B of a corresponding cell in step 302. The Radio Link Reconfiguration Prepare message includes USTS parameters. The USTS parameters are information about a UL scrambling code, a UL channelization code, and a USTS indicator. The USTS parameters are determined by the SRNC. The operation of FIG. 14 is described on the premise that the SRNC is identical to a CRNC. If the SRNC is different from the CRNC, the SRNC transmits the above information toa DRNC and the DRNC transmits the received information to the Node B. If the SRNC is different from the DRNC, the SRNC transmits only the USTS indicator information to the DRNC. Then, the DRNC determines a UL scrambling code and a UL channelization code for USTS and transmits the codes to the Node B and the SRNC. If the SRNC can determine a scrambling code time offset in step 302, the SRNC transmits the determined scrambling code time offset together with USTS parameters to the Node B. For example, if the SRNC receives the PD and an RTT from the Node B through a measurement procedure, it can determine the scrambling code time offset. Time information about256xm basis synchronization and scrambling code synchronization can be added to the scrambling code time offset information.

In step 303, the SRNC determines whether to transition the UE to the USTS mode by analyzing a message received from the Node B. Specifically, the SRNC determines whether a Radio Link Reconfiguration Response message including the scrambling code time offset has been received from the corresponding Node B. If the received message is not the Radio Link Reconfiguration Response message, the SRNC goes to step 306. If the received message is not the Radio Link Reconfiguration Response message, it is then a USTS conversion failure message indicating the failure of the Radio Link Reconfiguration Prepare message. In step 306, the SRNC determines that it is impossible to transition the UE to the USTS mode by the USTS conversion failure message. The USTS conversion is failed when the Node B does not support the USTS, or in the failure cases as described according to the conventional technology.

Meanwhile, if the SRNC receives the Radio Link Reconfiguration Response message from Node B in step 303, the SRNC analyses the scrambling code time offset information for USTS set in the Radio Link Reconfiguration Response message in step 304. The Radio Link Reconfiguration Response message may include the scrambling code time offset itself, or the time difference between the start point of a current received UE frame and that of a P-CCPCH frame, a value required to make the time difference be 256chipsxm, and a PD.

The PD is'the mean value 1/2 of the value calculated by subtracting To from the difference from the start points of a corresponding DL DPCH and the UL DPCH.

In addition, the Radio Link Reconfiguration Response message may include a plurality of pieces of information at the same time. While it is assumed in FIG.

14 that the SRNC is identical to the CRNC, if the SRNC is different from the CRNC, the SRNC receives the above information from the DRNC and the DRNC receives the information from the Node B. The PD in the information can be obtained from the Node B using a measurement procedure instead of receiving during the USTS mode conversion. The PD can be a value resulting from the measurement procedure or from a pre-defined RRT. The RRT is defined as the difference between the start points of a corresponding DL DPCH and a UL DPCH.

From the RRT, the PD (=(RTT-To)/l) is obtained.

After analyzing the Radio Link Reconfiguration Response message, the SRNC transmits an RRC signaling message to the UE to transition to the USTS mode and then ends the procedure. A Radio Bearer Reconfiguration Prepare message, for example, is used as the RRC signaling message. The SRNC transmits time information and channel information of the UE received from the Node B, including the UL scrambling code, the UL channelization code, the USTS indicator, and the time offset by the RRC signaling message.

Finally, a description of the Node B during the USTS mode conversion will be given with reference to FIG. 15.

FIG. 15 is a flowchart illustrating the operation of the Node B when the UE communicating on a DPCH transitions to the USTS mode. Referring to FIG.

15, the Node B receives a USTS mode-related message from the SRNC in step 401. An NBPA message for the USTS mode conversion is, for example, the Radio Link Reconfiguration Prepare message. The received Radio Link Reconfiguration Prepare message includes information required for conversion to the USTS mode, inclusive of the UL scrambling code, the UL channelization code, and the USTS indicator.

In step 402, the Node B determines whether it is possible to transition to the USTS mode. If the USTS mode conversion is possible, the Node B goes to step 403. if the USTS mode conversion is impossible, the Node B goes to step 407.

In step 407, the Node B transmits the Radio Link Reconfiguration Failure message to the SRNC and ends the procedure.

On the other hand, if the USTS mode conversion is possible, the Node B transmits the Radio Link Reconfiguration Response message with the scrambling code time offset information to the SRNC in step 403. The Radio Link Reconfiguration Response message may include the scrambling code time offset itself, or the time difference between the start point of a current received UE frame and that of a P-CCPCH frame, a value required to make the time difference equal to 256chipsxm, and a PD. If the Node B has transmitted the PD or a related RTT to the SRNC beforehand by the measurement procedure, the SRNC may determine time information for a 256xm basis synchronization or scrambling code synchronization and transmit the time information to the Node B. In this case, there is no need to add the time information to the Radio Link Reconfiguration Response message and the Node B can obtain information about the reception time of a UL DPCH based on the time information received from the SRNC. Here, the time information can be Tall orT add in the present invention.

The Node B prepares UL channel coding according to the scrambling code, the UL

channelization code, and the USTS indicator in step 404. That is, the Node B checks the UL scrambling code and the DPDCH and DPCCH channelization codes and prepares them. In step 405, the Node B implements the scrambling code synchronization by determining the difference between a frame start point and a scrambling code start point according to the scrambling code time offset information. The Node B shifts the scrambling code by the scrambling code time offset from the frame start point and then prepares for spreading. If the UE is the first one to use a USTS scrambling code, the scrambling code time offset is 0 and the frame start point can be rendered identical to the scrambling code start point. However, if the USTS scrambling code synchronization is based on a P-CCPCH, even if the UE is the first one to use the USTS scrambling code, the scrambling code time offset may not be 0. In this case, the Node B delays the scrambling code by the scrambling code time offset and prepares to receive a UL DPCH. The scrambling code synchronization can be performed in a scrambling code synchronizer in the Node B that is symmetrical in structure to its counterpart shown in FIG. 4. The scrambling code synchronizer in the Node B will be described later.

The Node B receives a Radio Link Reconfiguration Commit message acknowledging the USTS mode conversion from the SRNC. The Radio Link Reconfiguration Commit message has time information for the USTS mode conversion and the Node B prepares to receive a UL signal at a time indicated by the time information. In step 408, the Node B receives UL DPCH data from the UE transitioned to the USTS mode and ends the procedure.

The structure of the aforementioned scrambling code synchronizer will be described with reference to FIG. 16.

FIG. 16 is a block diagram of a scrambling code synchronizer in a Node B according to the present invention. Referring to FIG. 16, a scrambling code generator310 generates a scrambling code for a UL DPCH assigned to the UE.

A controller 320 receives USTS time information of the UE and controls the scrambling code generator310 or a delay330 based on the difference between the start point of the received UL DPCH and a scrambling code start point. The delay 330 delays the scrambling code by a scrambling code time offset according to a time information command received from the controller 320 to make the start points of the scrambling code and a frame identical. A multiplier 340 receives the UL DPCH data and multiplies the received UL DPCH data by the scrambling code received from the delay 330. A frame demodulator 350 demodulates the data received from the multiplier 340 using a channelization code.

The case where other UEs are using a scrambling code will be described below.

The SRNC transmits information about UL scrambling codes in use for USTS, UL DPDCH and DPCCH channelization codes, and a scrambling code start point serving as a reference time for the other UEs to the Node B. The information is transmitted by, for example the Radio Link Reconfiguration message. The scrambling code start point information may include information for256xm basis synchronization and scrambling code synchronization. Then the Node B transmits time information measured using an established radio link, that is, a PD measurement to the SRNC. The PD is calculated by subtracting To from the difference between the start points of a corresponding DL DPCH and a UL DPCH. The SRNC transmits the time information (PD) received from the Node B to the UE and the UE transmits data on the uplink for USTS according to the received time information.

In the case whether other UEs are using a scrambling code for the USTS service, the UE, the SRNC, and the Node B operate as described below, in comparison with the conventional UEs.

The UE requests conversion to the USTS mode to the Node B during communicating on a DPCH, or the Node B attempts conversion to the USTS mode for the UE that receives a service on a DPCH only after the USTS mode.

The UE transmits UL DPCH data based on a time offset for USTS in the information received from the SRNC for conversion to the USTS mode. If the time offset is 0, the UE performs the conventional DPCH operation. On the contrary, if the time offset is not 0, the UE performs synchronization by the time offset. The time offset includes information required to make the difference between the start points of a current received UE frame and a P-CCPCH frame equal 256chipsxm, that is, time information representing how much earlier or later the UE should transmit a UL DPCH with respect to the previous UL DPCH, or information about a PD generated during transmission of a UL DPCH. If the UE receives the PD, it transmits the UL DPCH earlier by a time equal to the PD.

The SRNC determines the time offset and the UE receiving the time offset transmits the UL DPCH earlier or later by the time offset. If USTS scrambling code synchronization is based on a P-CCPCH, the SRNC transmits time information for the scrambling code synchronization and the UE delays a scrambling code by the time offset prior to transmission. The scrambling code synchronization can be performed by use of the scrambling code synchronizer shown in FIG. 4. Even if the scrambling code synchronization is based UE time, the SRNC transmits a corresponding offset to the UE and the UE performs the scrambling code synchronization according to the received time offset.

In the case where other UEs are using a scrambling code for the USTS service, the SRNC operates in the same manner as during the USTS mode conversion for the UE when it is the first one to be assigned to a scrambling code for the USTS service. Therefore, a description of the operation of the SRNC will be omitted.

The Node B also operates in the same manner as when the UE is the first one to be assigned to a scrambling code for the USTS service, except that it transmits different information in step 402 of FIG. 15.

In step 402, the Node B notifies the SRNC whether it will support the USTS mode conversion by a response message. Here, the Node B transmits the scrambling code time offset to the SRNC.

To supply information about the scrambling code time offset, the Node B transmits one of the time difference between the start points of a current received UE frame and a P-CCPCH frame, a value required to make the time difference equal 256chipsxm, a PD, and the time difference between the start points of a scrambling code and a corresponding frame. When the UE is the first one to be assigned to a scrambling code for the USTS service, there is no scrambling code serving as a reference, whereas when other UEs are operating in the USTS mode, the start point of the scrambling code in use for the UEs serves as a reference point. Therefore, a scrambling code offset is generated with respect to the scrambling code start point.

In the case where a target cell does not support a handover for the USTS service, the SRNC and the UE operate as follows.

In this case, the SRNC discontinues the USTS service based on a measurement report received from the UE and determines to establish a radio link with the new cell by the Radio Link Setup procedure or the Radio Link Addition procedure. Here, the SRNC converts the USTS mode to the normal mode for the
UE by the Radio Link Reconfiguration procedure. The SRNC transmits the
Active Set Update message or the Radio Bearer Reconfiguration message to notify the UE of the mode conversion procedure.

That is, the UE that was receiving the USTS service implements a handover in the following way.

After transmitting the Radio Link Setup Response message to the RNC or
Node B of the new cell, the SRNC receives a response message from the RNC or Node B. If the SRNC receives information representing that the new cell does not support the USTS service by the response message, or has the information beforehand, it transmits the Radio Link Reconfiguration Prepare message to the
Node B or RNC of an existing cell (one ore more radio links may exist) to convert the USTS mode to the normal mode for the UE. Then, the SRNC discontinues the USTS service for the UE and transmits a message for a typical
DPCH service, for example, the Radio Bearer Reconfiguration signaling message.

*Signaling messages transmitted in the above second and third steps include time parameters or separate signaling messages indicating time are transmitted, so that the UE and each cell discontinue the USTS at the same time and use DPCHs.

If the UE that was using the USTS is to establish a new radio link in a handover area, the SRNC transmits the Radio Link Setup Response message or the Radio Link Addition Request message to a corresponding RNC or Node B.

Upon receipt of the request message, the DRNC or Node B can transmit a response message to notify whether it supports the handover or not. The response message can be the Radio Link Setup Response message or the Radio Link
Addition response message, as given in Table 4 below.

Table 4
EMI45.1

<tb> <SEP> Presene <SEP> IE <SEP> type <SEP> and <SEP> Semantics <SEP> Criticalit <SEP> Assigned
<tb> IE/Group <SEP> Name <SEP> Range. <SEP> Criticalit
<tb> <SEP> e <SEP> reference <SEP> description <SEP> y
<tb> <SEP> y
<tb> Message <SEP> Discriminator <SEP> M <SEP> 9.2.1.45
<tb> Message <SEP> Type <SEP> M <SEP> 9. <SEP> 2. <SEP> 1. <SEP> 46 <SEP> YES <SEP> Reject
<tb> CRNC <SEP> Communication
<tb> CRNC <SEP> Communication <SEP> m <SEP> 9.2.1.18 <SEP> YES <SEP> Ignore
<tb> Transaction <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.62
<tb> <SEP> The <SEP> reserved
<tb> Node <SEP> B <SEP> Communication <SEP> value <SEP> All

<tb> ContextID <SEP> NBCC <SEP> shall
<tb> <SEP> not <SEP> be <SEP> used.
<tb>

Communication <SEP> Control
<tb> Communication <SEP> ID <SEP> M <SEP> 9.2.1.15 <SEP> YES <SEP> Ignore
<tb> <SEP> 1 <SEP> to
<tb> RL <SEP> Information <SEP> < maxn
<tb> <SEP> EACH <SEP> Ignore
<tb> Response <SEP> oofRL
<tb> <SEP> s >
<tb> > RL <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.53
<tb> > RL <SEP> Set <SEP> ID <SEP> M <SEP> 9. <SEP> 2.2.39
<tb>
EMI46.1

<SEP> > UL <SEP> interference <SEP> level <SEP> M <SEP> 9. <SEP> 2. <SEP> 1. <SEP> 67
<tb> <SEP> C <SEP> > Diversity <SEP> Indication <SEP> NotFirst <SEP> 9.2.2.8
<tb> <SEP> RL
<tb> <SEP> > CHOICEdiversity >
<tb> <SEP> Indicatio) <SEP> 2
<tb> <SEP> <SEP> Combining <SEP> YES <SEP> Ignore
<tb> <SEP> Reference
<tb> <SEP> > > > RL <SEP> ID <SEP> M <SEP> 9.2.1.53 <SEP> RL <SEP> ID <SEP> for <SEP> the
<tb> <SEP> combining
<tb> <SEP> #Non <SEP> Combining <SEP> or
<tb> YES <SEP> Ignore
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<tb> <SEP> Hs > <SEP> DCH <SEP> shall <SEP> be
<tb> <SEP> included
<tb> <SEP> <SEP> <SEP> DCH <SEP> ID <SEP> M <SEP> 9.2.1.20
<tb> <SEP> > > > > Binding <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.4
<tb> <SEP> #Transport <SEP> Layer
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<tb> <SEP> 0 <SEP> to
<tb> <SEP> < Num
<tb> <SEP> > DSCH <SEP> Information
<tb> <SEP> of <SEP> GLOBAL <SEP> Ignore
<tb> <SEP> Response
<tb> <SEP> >
<tb> <SEP> <SEP> DSCH <SEP> ID <SEP> M <SEP> 9.2.1.27
<tb> <SEP> > > Binding <SEP> ID <SEP> M <SEP> 9. <SEP> 2.1.4
<tb> <SEP> #Transport <SEP> Layer
<tb> <SEP> M <SEP> 9.2.1.63
<tb> <SEP> Address
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2.2.46
<tb> <SEP> > USTS <SEP> Support <SEP> C
<tb> <SEP> Indicator <SEP> USTS
<tb> <SEP> Criticality <SEP> diagnostics <SEP> O <SEP> 9.2.1.17 <SEP> YES <SEP> Ignore
<tb>
In Table 4, USTS Support Indicator indicates whether cells in a corresponding Node B support the USTS service or not. USTS Support Indicator is conditional because it is transmitted only when the SRNC requests a USTS handover to the Node B. If the Node B transmits information indicating whether it supports the USTS service regardless of request from the SRNC, C-USTS is changed to M short in order to supply the USTS Support Indicator in the message.

In accordance with the present invention as described above, slot synchronization and frame synchronization can be achieved among UEs in a USTS where a plurality of UEs use a single scrambling code. Asynchronous UL DPCHs with different delays can be synchronized to one another in an initial synchronization.

A UE using the USTS service can implement a handover while maintaining the USTS service even in a target cell, to thereby continue the USTS service.

Furthermore, a data communication service is provided suitable for a cell by allowing a UE to transition from a normal mode or a non-USTS mode to a USTS mode.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

Method for performing USTS handover and USTS mode switchin in a mobile communication system

Claims of corresponding document: **WO0207345**

WHAT IS CLAIMED IS:

1. A handover controlling method in a radio network controller (RNC) connected to a first Node B and a second Node B in a mobile communication system where an Uplink Synchronous Transmission Scheme (USTS) service occurs between the first Node B and a ~~user equipment~~ (UE) within a cell of the first Node B and the UE hands over when the UE is located in a handover, area across cell areas of the first Node B and the second Node B, the cell area of the second Node B being adjacent to the cell area of the first Node B, the method comprising the stepsof : determining if the handover for the UE is possible ; transmitting handover information to the second Node B if the handover is possible, the handover information including the scrambling code of the UE, a scrambling code time offset representing the time difference between the start point of the scrambling code used for data communication between the UE and the first Node B and the start point of a uplink data frame, and a channelization code for a transmission channel of the data; and transmitting a command to theUE through the first Node B, requesting the UE to hand over to the second Node B if the RNC receives a response message for the handover information from the second Node B indicating that the handover is possible.

2. The method of claim 1, wherein the transmission channel is an uplink dedicated physical channel.

3. The method of claim 1, wherein the handover determination determined by analyzing a measurement report received from the UE.

4. The method of claim 1, wherein the channelization code is an Orthogonal Variable Spreading Factor (OVSF) code.

5. The method of claim 1, wherein the handover information is information about the UE receiving the USTS service, and the information is stored in the RNC.

6. A handover controlling method in a Node B in a mobile communication system where a Uplink Synchronous Transmission Scheme (USTS) service occurs between a first Node B and a user equipment (UE) within a cell'of the first Node B and the UE hands over wh~~en the UE~~ is located in a handover area across cell areas of the first Node B and a second Node B, the cell area of the second Node B being adjacent to the cell area of first Node B, the method comprising the stepsof :</RTI> receiving handover information indicating that the UE is receiving the USTS service from an radio network controller (RNC), the handover information including a channelization code for a data transmission channel of the UE, a scrambling. code used for the data communication, and a scrambling code time offset representing the time difference between the start point of the scrambling code and the start point of a uplink data frame; and transmitting a response message for the handover information to the RNC and assigning a handover channel according to the channelization code; and performing scrambling code synchronization by setting the start point of the uplink data frame relative to the scrambling code start point according to the scrambling code time offset.

7. The method. of claim 6, wherein the scrambling code synchronization step comprises: delaying the scrambling code generated from the Node B by the scrambling code time offset, for starting the scrambling code at a time later than the start point of a predetermined channel frame; despreading uplink data received from the UE with the delayed scrambling code and the channelization code.

8. The method of claim 7, wherein the predetermined channel is a primary common control physical channel.

9. The method of claim 6, wherein the scrambling code time offset is the time difference between the start point of a current uplink data frame received from the UE and the start point of the predetermined channel frame.

10. The method of claim 6, wherein the scrambling code time offset is a value determined such that the time difference between the start point of a current uplink data frame received from the UE and the start point of the predetermined channel frame is equal to a multiple of 256 chips.

11. The method of claim 9, wherein the predetermined channel is a primary common control physical channel.

12. The method of claim 10, wherein the predetermined channel is a primary common control physical channel.

13. The method of claim 6, wherein the scrambling code time offset is calculated by subtracting a propagation delay from the time difference between the start point of a uplink transmission channel frame received from the UE and a downlink transmission channel frame.

14. A method of converting a non-Uplink Synchronous Transmission Scheme (USTS) mode to a USTS mode between a Node B connected to a radio network controller (RNC) and a user equipment (UE) within a cell area of the Node B, comprising the stepsof : measuring by the Node B a round trip time (RTT) indicating the distance between the Node B an the UE; transmitting the measured RTT from the Node B to the RNC; transmitting from the RNC to the UE a scrambling code and a channelization code for use in the UE, and information representing a variance of the start point of a downlink data frame to be transmitted to the UE to make the downlink data frame start at a position apart from a reference time point of the Node B by a multiple of predetermined number of chips; and transmitting the scrambling code and the channelization code from the RNC to the Node B.

15. The method of claim 14, wherein the RNC determines whether to convert the non-USTS mode to the USTS mode for the UE by analyzing a measurement report received from the UE.

16. The method of claim 14, wherein the RNC determines whether to convert the non-USTS mode to the USTS mode for the UE upon receipt of a USTS mode conversion request from the UE.

17. The method of claim 14, wherein the channelization code is for an uplink dedicated physical channel.

18. The method of claim 14, wherein the scrambling code is an uplink data scrambling

code.

19. The method of claim 14, wherein the scrambling code time offset is the time difference between a start point of a current uplink data frame received from the UE and a start point of a primary common control physical channel frame.

20. The method of claim 14, wherein the scrambling code time offset is a value determined such that the time difference between a start point of a current uplink data frame received from the UE and a start point of a primary common control physical channel frame is equal to a multiple of 256 chips.

21. The method of claim 14, wherein the scrambling code time offset is calculated by subtracting a propagation delay from the time difference between a start point of a uplink transmission channel frame received from the UE and a start point of a downlink transmission channel frame.

22. A method of converting from a non-Uplink Synchronous Transmission Scheme (USTS) mode to a USTS mode in a communication between a Node B connected to an radio network controller (RNC) and a user equipment (UE) within a cell area of the Node B, comprising the stepsof : receiving a message including information representing a variance of the start point of an uplink data frame received from the UE to make the uplink data frame start at a position apart from a reference time point of the Node B by a multiple of predetermined number of chips, and the channelization code and scrambling code of a transmission channel on which the uplink data is transmitted from the RNC; calculating a scrambling code time offset if it is determined that the USTS mode conversion is possible for the UE, and transmitting a response message including the scrambling code time offset to the RNC; and assigning the received channelization code and scrambling code to the communication and determining the start points of the uplink data frame and the scrambling code according to the scrambling code time offset, and transitioning to the USTS mode.

23. The method of claim 22, wherein the USTS mode conversion, further comprising the stepsof : delaying the scrambling code generated from the Node B by the scrambling code time offset to start the scrambling code at a position later than the start point of a predetermined channel frame by the scrambling code time offset ; despreading uplink data received from the UE with the delayed scrambling code and the channelization code.

24. The method of claim 23, wherein the predetermined channel is a primary common control physical channel.

25.. The method of claim 22, wherein the scrambling code time offset is the time difference between a start point of a current uplink data frame received from the UE and a start point of the predetermined channel frame.

26. The method of claim 22, wherein the scrambling code time offset is a value determined such that the time difference between a start point of a current uplink data frame received from the UE and a start point of the predetermined channel frame is equal to a multiple of 256 chips.

27. The method of claim 25, wherein the predetermined channel is a primary common control physical channel.

28. The method of claim 26, wherein the predetermined channel is a primary common control physical channel.

29. The method of claim 22, wherein the scrambling code time offset is calculated by subtracting a propagation delay from a time difference between a start point of an uplink transmission channel frame received from the UE and a start point of a downlink transmission channel frame.

30. A method of converting a non-Uplink Synchronous Transmission Scheme (USTS) mode to a USTS mode in a communication between a Node B connected to an radio network controller (RNC) and a user equipment (UE) within a cell area of the Node B, comprising the stepsof : receiving a predetermined uplink signal from the UE, measuring the propagation delay of the received channel signal, and transmitting the propagation delay measurement and a USTS mode conversion request to the RNC by the Node B; determining an additional delay based on the propagation delay measurement and transmitting the determined additional delay to the UE by the RNC; and starting to transmit an uplink data transmission signal by the UE after the propagation delay and the additional delay from reception of a downlink data transmission channel signal.

31. The method of claim 30, wherein the additional delay is calculated by subtracting twice the propagation delay between the downlink data transmission channel and the uplink data transmission channel from a common propagation delay.

32. The method of claim31, wherein the common propagation delay is used by all UEs, the UEs being one of located in the same cell and using an identical USTS scrambling code, and an uplink dedicated physical channel signal received from the RNC has a predetermined delay from all the UEs.

33. The method of claim 30, wherein the predetermined channel is a random access channel.

34. The method of claim 30, wherein the transmission channel is a dedicated physical channel.
